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**Debt-sharing and Secession :
A generational accounting approach**

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Abstract

This paper investigates one of the most important financial issues arising from a secession or a country partitioning, namely the sharing of the national public debt. Extending Drèze's distributive neutrality condition, we use the generational accounting technique and propose a dynamic debt-sharing criterion which takes into account both the true debt future generations inherit and their contributive capacity. The equivalence with Drèze's static rule is only obtained in the steady growth framework in the absence of initial regional debt. An application of our criterion to the Belgian case offers striking results.

Keywords : debt-sharing, public debt, secession, generational accounting, distributive neutrality

JEL Classification : H60, H77.

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Introduction

Among the various forms of decentralization, one is particularly important due to its political, social and economic consequences, namely the case of a secession by a regional entity. Though extreme as a decentralization process, it is not unusual in today's world: the dramatic crisis in the Balkans or other recent secessions in the former Soviet Block witness the dynamism of nationalism in contemporary societies¹. It is likely that in the future other secessions will arise. The case of Québec is often referred to as a possible candidate for secession ; mounting nationalist tensions in Belgium could as well lead to the secession of one of its regions, which would presumably lead to the falling apart of the Belgian federation as a whole.

The aim of this article is to study more closely one of the most important financial issues arising from a secession : the sharing of the (national/federal) public debt among the regions of the prior state.

Most of the criteria discussed in the literature or used in actual secessions are neither based on efficiency nor equity but rather on short-run political feasibility arguments. Our main objective here is to develop an approach based on equity-efficiency criteria. Extending the seminal contribution of Drèze (1993), we propose a debt-sharing rule so that there is no pure financial incentive for a region to secede. Therefore, the secession would only be motivated by prospects of efficiency gains. Our criterion is based on the generational accounting technique, focusing on the net fiscal burden (called generational account) that each individual must pay to the state over his whole lifetime. More precisely, as will appear in definition 1, we determine a formula that shares the debt between the regions in such a way that both current and future generations' net burden are affected equiproportionally after the secession has occurred. Our distributive neutrality criterion thus aims at reproducing in the future the generational accounts ratios observed among the regions at the time of a secession.

Our rule takes into account the dynamic features of public finances which is very important when public debt has to be shared. In a static context such as Drèze's, when some long-run budgetary constraint is applied the share each region receives not only depends on the distributive neutrality criterion but also on the objectives which are set for the public debt ratio. In a dynamic context such as the one developed here, the debt-sharing rule also crucially depends on a political decision, namely the relative tax treatment to be given to current and future generations. Indeed, since public debt is an important component of intergenerational transfers, the time-span set to reimburse the debt directly conditions the amount of intergenerational transfers. When it is limited in time, current generations bear most of the public debt burden and the richer region will receive a larger share of the debt. When, on the contrary, debt reimbursement is left to future generations, debt shares will tend to be larger for regions benefiting from better long-run prospects.

¹ Bookman (1993) refers to thirty-three seceding regions in Asia, Africa, the Middle East, North America, the former Soviet bloc and Western Europe.

The rest of this article is organized as follows. In the second section, we present some of the criteria discussed in the literature or used in actual secessions. In the third section we present our criterion. We start by a description of the generational accounting-based technique used to compute the debt shares of the regions before showing how the political decision as to debt reimbursement affects the debt-sharing formula. Last, we show that Drèze's static rule may be seen as particular cases of our general approach, at least under some stationarity conditions. Section 4 presents an illustration for Belgium.

2. Debt-sharing criteria

A secession situation often corresponds to a very tense political crisis and can in some cases lead to some sort of (civil) war, such as in Yugoslavia for instance. Therefore, in the negotiations paving the way to an overall settlement swiftness and easiness of decisions-making and -implementation are likely to prime over fine-tuned processes which are long and difficult to implement.

In particular, when it comes to discussing public debt sharing, easily quantifiable and understandable variables are often preferred to complicated theoretically-based formulae.

Among the variables which are commonly used, the population and gross regional product (GRP) or domestic product are certainly the most important ones. These criteria can be qualified as "politically sustainable" since they offer the easy, generally acceptable, solutions which politicians tend to favour². However, these criteria often have no theoretical basis.

Another politically sustainable debt-sharing rule, proposed by Deschamps (1993), recommends sharing the national debt in such a way that the regional deficit ratio (in % of the GRP) remains unchanged for all the regions after a secession. In the case where initial deficit-GRP ratios are identical, this criterion consists in sharing public debt according to the ratios of the GRPs on national GDP. Deschamps' proposition offers the advantage of simplicity and easy implementation but it e.g. ignores longer-term regional dynamics linked to different growth paths and demographics or to a process of debt reduction.

A significantly different approach is based on the history of the debt build-up. This "historical criterion" requires a comparison of the regional contributions to the national budget in terms of both revenues and primary expenditures. Two particular problems can be emphasized with respect to this approach. The first is practical and relates to the limited availability of historical regional budgetary data in most countries³. The second is of a more political nature : the historical criterion ignores

² In this respect, see the interesting discussion made by De Grauwe following Drèze's (1993) proposals in *Economic Policy*.

³ In the case of Belgium, estimations made in 1985 were based on data going back to 1976 only. See note 1 in Van Parijs (1993).

the political process leading to the debt creation and confers the responsibility of the (past) debt creation to current generations, regardless of the environment in which the debt was built.

A last important criterion was proposed by Drèze (1993). It is, to our knowledge, the only debt-sharing mechanism which is based on a solid theoretical foundation. The principle advocated by Drèze is simple : a secession should not affect the aggregate transfers between the seceding region and the rest of the nation. In other words, the decision to secede should be motivated only by efficiency considerations, not by the perspective of a "free lunch" resulting from lower transfers to the rest of the nation. In this perspective, secessions would ultimately be Pareto improving institutional changes. Drèze's rule uses budgetary aggregates as a convenient summary characterization only; the criterion is the possibility that no citizen be made better or worse-off on account of the secession itself.

In a stationary or balanced growth world with a constant debt ratio, it is shown that this "budgetary distributive neutrality" (BDN) requires that each region be given a share of the national debt corresponding to the share of its primary budget balance in the national budget balance⁴. This rule ensures that each region should be able to maintain the same level of spending and receipts without new debt creation after the secession occurs. In this perspective, net contributors continue to pay the same interregional transfers as before.

Some authors, however, argue that the result of the BDN rule is likely to be politically unacceptable if the will to secede is partly based on the fact that the (richer) seceding regions perceives interregional transfers to be too high and wishes to reduce the size of its contributions. Another debate arises from the perception that some of the interregional transfers might result from free-riding behavior or more laxist policies in recipient regions⁵. In these cases a BDN rule would in fact reproduce "unfair" transfers in the long run.

In the following sections we extend Drèze's rule. However, instead of defining distributive neutrality in a stationnary framework, we generalize Drèze's proposals in a dynamic set-up based on the generational accounting technique. Our sharing rule ensures that current interregional solidarity between representative individuals is maintained after a secession or country partitioning, both among living generations (over the rest of their lifespan) and among future generations (over their whole lifetime). Ensuring the maintenance of solidarity between regions implies a long-run calculation. Here we provide a dynamic calculation which takes the future social entitlements acquired by current generations in each region into account.

⁴ The basic rule advocated by Drèze is similar to the one of Deschamps under very specific conditions (budgetary balance at the national level, no initial regional debts, constant debt ratio). However, Drèze's criterion can be easily adapted to specific cases of initial debt and deficit imbalances or debt-ratio constraints.

⁵ See Roland et al. (1999).

3. A generational accounting approach

The key idea of generational accounting is to summarize in one figure the expected net discounted amount of money that the representative agent of each generation must pay to the state during its lifetime⁶. In this approach the net taxes are discounted on the basis of an exogenous interest rate and weighted by the survival probabilities.

Generational accounts are computed on the basis of statistical data collected for a period of reference, denoted by t . Since our purpose is to assess what is to be paid in the future, net taxes paid by present generations before period t are not evaluated here, i.e. the technique is purely prospective.

3.1. Generational accounts

More formally, the generational account of one representative agent born in period k , in region i , and evaluated at time t is given by

$$(1) \quad n_{t,k}^i = \sum_{s=t}^{k+D^i} \frac{T_{s,k}^i p_{s,k}^i}{(1+r)^{s-t}}$$

where $n_{t,k}^i$ denotes the generational account of generation k in region i ($i=1,\dots,I$), $T_{s,k}^i$ is the net tax paid by generation k in period s , $p_{s,k}^i$ is the probability to be alive in period s given that the individual is alive in t , r is the exogenous discount rate and D^i the age limit. The net tax $T_{s,k}^i$ takes into account all the taxes and transfers attached to each age group as well as other taxes and primary public expenditures which are shared proportionally to the population size of the nation (if taken from the federal budget) or the region (if taken from the regional budget). It should be noted that $n_{t,k}^i$ can be positive or negative depending on the age structure of taxes and spending and the parameters used.

The following assumptions are made for prospective purpose : (i) the interest rate is constant over time, (ii) the survival probabilities are those observed in period t , (iii) the rate of productivity growth is constant over time and equal across regions.

In addition, the usual Auerbach-Kotlikoff methodology suggests that regional age-specific net taxes evolve with productivity growth for current generations. This means that the net tax paid by a thirty years old agent in 10 years is exactly $(1+g)^{10}$ times the net tax paid by a thirty years old agent today, g being the rate of growth. This assumption is very convenient but implies that all the budgetary effort required by long run debt sustainability are transferred on future generations. In other words, the “social entitlements” of current living generations cannot be questioned in the classical Auerbach-Kotlikoff approach. An alternative approach, which we explore later, could be to equiproportionally modify the net taxes levied on current generation by a factor π , lower or higher than unity.

⁶ See Auerbach et al., 1991 and 1994, and Kotlikoff, 1992.

We assume for the moment that $n_{t,k}$ given in equation (1) represents the generational account under this classical approach. Multiplying generation k 's account by the size of this generation in period t , $P_{t,k}^i$, one obtains the net aggregate lifetime tax of generation k in region i :

$$(2) \quad N_{t,k}^i = n_{t,k}^i P_{t,k}^i$$

3.2. Intertemporal budget constraints

In order to derive future generations' accounts, the use of intertemporal budget constraints is necessary. In a purely national government there would be a single national intertemporal budget constraint implying national financing for all expenditures. In a multiregional context, such as here, a budgetary constraint must be defined for each region.

This constraint stipulates that the regional debt, including the share of national debt transferred ($\partial_i B_t^n$) to region i , must be reimbursed one day. The true debt bequeathed to future generations in region i , TD_t^i , is given by the sum of the current regional debt (B_t^i) and the share of national debt transmitted to region i minus the net expected contributions of present generations in region i (which may be negative):

$$(3) \quad TD_t^i = B_t^i + \partial_i B_t^n - \sum_{s=0}^{D^i} N_{t,t-s}^i$$

However, changes might modify the generational accounts of current generations in the future. Suppose that net taxes in region i are modified by a proportional factor π_P^i . The true debt would then become

$$(4) \quad TD_t^i = B_t^i + \partial_i B_t^n - \pi_P^i \sum_{s=0}^{D^i} N_{t,t-s}^i$$

It is useful to derive the average generational account of individuals of future generations. This can be done by assuming that each agent will pay an equal discounted net tax corrected for productivity growth. In discounted and growth-corrected terms, the average tax of future generations in region i , $\tilde{n}^i$ corresponds to:

$$(5) \quad TD_t^i = \tilde{n}^i \sum_{s=1}^{\infty} \frac{P_{t+s,t+s}^i (1+g)^s}{(1+r)^s} = \tilde{n}^i W_t^i$$

where $P_{t+s,t+s}$ denotes the initial size of future generation $t+s$. W_t^i may be defined as the weight - in efficiency units - of future generations in region i . Note that $\tilde{n}^i$ can also be expressed as a fraction of the tax born by the newborns in region i , $\tilde{n}^i = \pi_P^i n_{t,t}^i$. The intertemporal budgetary constraint in region i can then be rewritten as

$$(6) \quad \pi_F^i W_t^i n_{t,t}^i = B_t^i + \partial_i B_t^n - \pi_P^i \sum_{s=0}^{D^i} N_{t,t-s}^i$$

For a given proportion of the national debt received, ∂^i , there is an infinity of combinations (π_F^i, π_P^i) which allow to balance the budget in each region i . E.g. for π_P^i equal to unity (which corresponds to unchanged entitlements for the living generations), π_F^i is the only endogenous variable. This is the assumption suggested in the works of Auerbach and Kotlikoff (AK henceforth). And this implies that budgetary adjustments are borne by future generations only. A contrario, if π_F^i is set equal to one, future generations' net taxes are the same as current net taxes and π_P^i becomes the only endogenous variable. In this case budgetary adjustments affect the current living generations only (in what follows LG stands for living generations).

3.3. Distributively neutral debt-sharing rules

We first focus on distributive neutrality across regions before specifying the impact of intergenerational budgetary adjustment decisions on the debt-sharing mechanism.

Definition 1 *A distributively neutral sharing-rule is a set of debt shares $(\partial^1, \dots, \partial^I, \dots, \partial^J)$ such that (i) living generations' accounts reveal the same regional discrepancies as the ones prevailing under the assumption of unchanged future social entitlements and (ii) future generations' accounts reveal the same regional discrepancies as the ones observed for newborns under the same assumption.*

The differences of net tax benefits can be obtained either by measuring the difference between generational accounts in different regions in absolute terms or by measuring the ratio of generational accounts. In what follows it is this second approach which we focus on. However, in order to respect the intertemporal budget constraints, a distributively neutral debt-sharing rule can only be reached through a proportional transformation of the current and future generational accounts:

Proposition 1 *The set of distributively neutral sharing-rules is the set of pairs (π_F^i, π_P^i) such that (i) $\pi_F^i = \pi_F$, (ii) $\pi_P^i = \pi_P$ for all i , (iii) $\sum_i \partial^i = 1$ and (iv) respecting the regional intertemporal budget constraints*

$$\pi_F W_t^i n_{t,t}^i = B_t^i + \partial_i B_t^n - \pi_P \sum_{s=0}^{D^i} N_{t,t-s}^i$$

Condition (i) implies that the ratios of the future generations' representative agents accounts are identical to the ratios observed for the newborns. Condition (ii) implies that these ratios are also maintained for living generations. Condition (iii) ensures that national public debt is fully distributed among the regions. Finally, conditions (iv) guarantees the long-run sustainability of the debt-sharing.

Note that the aggregation of conditions (iv) with respect to condition (iii) gives the national intertemporal budget constraints:

$$(7) \quad \pi_F \sum_{i \in I} W_t^i n_{t,t}^i = B_t^i + B_t^n - \pi_P \sum_{i \in I} \sum_{s=0}^{D^i} N_{t,t-s}^i$$

Since an infinity of pairs (π_F, π_P) respecting conditions (i)-(iv) exist, there is also an infinity of distributively neutral sharing-rules according to our definition. We present here two extreme cases : the AK sharing-rule where $\pi_P = 1$, and the LG sharing-rule where $\pi_F = 1$.

3.3.1. AK debt-sharing rule

The AK debt-sharing rule satisfies the unchanged « social entitlements » assumption presented above. In this case, one looks for the combination $(\pi_{AK,F}, 1)$ which leaves all budgetary adjustments to future generations. The system contained in the above proposition sums up as a system of $I+1$ equations with one budgetary constraint for each region and one aggregated, national budgetary constraint (7). The $I+1$ unknown variables are the regional shares of the debt and $\pi_{AK,F}$, an intergenerational imbalance indicator. From (7), one gets

$$\pi_{AK,F} = \frac{\sum_{i \in I} B_t^i + B_t^n - \pi_P \sum_{i \in I} \sum_{s=0}^{D^i} N_{t,t-s}^i}{\sum_{i \in I} W_t^i n_{t,t}^i}$$

Where $\pi_{AK,F}$ clearly depends on the the true debt bequeathed to future generations. Using the regional budgetary constraints it is then possible to obtain the regional debt-shares

$$\partial_{AK,F}^i = \frac{\pi_{AK,F} W_t^i n_{t,t}^i + \sum_{s=0}^{D^i} N_{t,t-s}^i - B_t^i}{B_t^n}$$

The solution to this system is unique. It shows that the share which a region obtains is a positive function of its current and future generations' accounts and a negative function of the amount of its initial debt.

3.3.2. LG debt-sharing rule

In the case of the LG sharing rule one looks for the combination $(1, \pi_{LG,P})$ which leaves all budgetary adjustments to current generations. The I+1 unknown variables are the regional debt-shares and $\pi_{LG,P}$, the reverse of which can be interpreted as an indicator of intergenerational imbalance. From (7), one obtains

$$\pi_{LG,P} = \frac{\sum_{i \in I} B_t^i + B_t^n - \sum_{i \in I} W_t^i n_{t,t}^i}{\sum_{i \in I} \sum_{s=0}^{D^i} N_{t,t-s}^i}$$

Using the regional budgetary constraints it then follows that

$$\partial_{LG}^i = \frac{W_t^i n_{t,t}^i + \pi_{LG,P} \sum_{s=0}^{D^i} N_{t,t-s}^i - B_t^i}{B_t^n}$$

This is a unique solution, different from the one obtained in the AK case. Indeed, any additional budgetary effort or room for manoeuvre is carried by- or benefits to the living generations proportionally to their relative generational accounts. In the AK approach budgetary efforts or gains affect the future generations relatively to the newborns generational accounts.

3.4. Comparison with static rules

The budgetary constraint (7) can be rewritten as

$$B_t^n = \pi_F \sum_{i \in I} W_t^i n_{t,t}^i + \pi_P \sum_{i \in I} \sum_{s=0}^{D^i} N_{t,t-s}^i - \sum_{i \in I} B_t^i$$

The first term on the right side of the equality sign measures the present value of net taxes paid by future generations. The second term corresponds to the present value of net taxes paid by living generations. The sum of these terms is the present value of the future primary balances of the nation :

$$B_t^n = \sum_{v=t}^{\infty} \frac{PB_v^n}{(1+r)^{v-t}} - \sum_{i \in I} B_t^i$$

Using (4), the same reasoning allows us to rewrite

$$(8) \quad \partial^i = \frac{\sum_{v=t}^{\infty} \frac{PB_v^i}{(1+r)^{v-t}} - B_t^i}{\sum_{v=t}^{\infty} \frac{PB_v^n}{(1+r)^{v-t}} - \sum_{i \in I} B_t^i}$$

Any sharing rule must be such that the share received by each region equals the ratio of the present value of future regional primary imbalance to the present value of

national primary imbalances, corrected by initial regional debt sizes. This is not a property of distributively neutral sharing rules but a consequence of the regional and national intertemporal budgetary constraints. There is an infinity of sharing rules satisfying this sustainability condition depending on the sequence of future primary imbalances imposed on each region. Our distributive neutral rules form a subset of all these sustainable sharing rules.

Let us now show that this distributively neutral subset contains a unique balanced growth rule and that this balanced growth solution corresponds to the Drèze's static proposal. This result can be written as follows :

Proposition 2 *On the steady growth path without initial regional debt the only distributively neutral debt-sharing rule when current net taxes are compatible with the intertemporal budget constraint is given by the ratio of primary balances $\delta^i = PB_t^i / PB_t^n$ observed at time t .*

To show this result one has to consider a population growing at a constant rate, m , with a constant demographic structure (i.e. the share of each regional age group is constant over time). Then, if individual net taxes are permanently adapted to economic growth, g , primary imbalances which measure the sum of net taxes raised on the entire population, evolve according to these two rates : $PB_v^i = PB_t^i (1+g)^{v-t} (1+m)^{v-t}$ for all i and v . This situation refers to a steady growth path. In this case the infinite sums at the numerator and denominator of equation (8) are geometric sequences with identical geometrical ratios. In the absence of initial regional debt, the unique steady growth sharing rule is given by the ratio of primary imbalances observed in period t .

To show that this solution corresponds to a feasible sharing rule, two problems must be solved. Is this rule compatible with the intertemporal budget constraints ? And is this sharing-rule distributively neutral ?

It comes out that these two questions are interrelated. Indeed, in budgetary terms, the sustainability condition implies that $PB_t^n = rB_t^n$. In generational accounting terms, it implies that it must be possible to guarantee the same generational accounts for future generations as for the newborns of time t . Analytically, the steady growth path is compatible with the intertemporal budgetary equilibrium if and only if equation (7) is satisfied with $(\pi_F, \pi_P) = (1, 1)$. The distributive neutrality thus automatically applies.

It should be noted that this steady growth solution is unique since any other pair of (π_F, π_P) that would respect the budgetary constraint would lead to a change in the future generations net taxes compared to the newborns and, consequently, in the primary balances, which would be contrary to the stationarity assumption.

4. Illustration for Belgium

4.1. Evaluating primary imbalances

The first step of our work consists in building consolidated regional budgets by eliminating all transfers between institutions and by disaggregating all national expenditures and revenues into their regional components.

Some regional data⁷ may easily be computed from the budgets of decentralized Belgian institutions (mainly Regions and Communities). The regional disaggregation of federal taxes and spendings as well as social security aggregates is more elaborated. Here we follow the methodology of Beine et al (1998). It is usually possible to collect information about age and regional distributions of taxes and transfers. However, for the taxes and transfers which are non specific to an age group or to a region we assume that they are distributed proportionally to the age group sizes of the nation (if taken from the federal budget) or the region (if taken from the regional budget).

The main results we obtain are the following : the consolidated primary surplus of the federal government (excluding the local authorities deficits) reaches 6.16% of GDP⁸. The regional distribution of this surplus reveals that Flanders experiences a very high surplus of 5.64% of (national) GDP compared to 0.23% for Wallonia and 0.29% for Brussels. The corresponding primary balance- GRP ratios are respectively 9.24%, 0.75% and 3.40%.

The age structure has a strong influence on primary imbalances. Per capita net taxes are negative below age 25 and after age 60. They are positive between ages 25 and 60. These figures also illustrate the strong discrepancies between the Belgian regions. Transfers are stronger in Brussels and Wallonia than in Flanders while taxes are very low in Wallonia relative to the Flemish region and to the national average.

4.2. Computing generational accounts for current generations

The second step of our analysis consists in computing generational accounts for current generations.

Using the primary imbalance age profiles, it is possible to infer the net burden current generations must still bear for the rest of their life. This is done by assuming that per capita revenues and expenditures in each region are adapted to the national real growth rate and that future survival probabilities for members of each generation correspond to those observed today. For our purpose we consider a constant real growth rate of 1.5% per year and a real interest rate of 5%⁹.

⁷ The detailed data sources and the regional shares in public finance aggregates can be found in Beine et al. (1998) or in Cattoir and Docquier (1999).

⁸ As compared to 6.0% in the 1999 federal budget.

⁹ These assumptions are consistent with the Belgian generations' accounts computed in Dellis and Lueth (1998). The value of the interest rate may appear too large.

The aggregate regional sharing of (lifetime) revenues and expenditures for current generations can easily be computed¹⁰. It appears that pensions (in the private sector) and health care (including disability) constitute a higher burden for future generations than the explicit public debt: the future entitlements for current living generations in these two sectors total 210,9% of GDP as compared to 115% for the federal public debt. However, future revenues in the social security sector approximately equal future entitlements (maintaining current federal transfers rules) while a primary surplus is observed for the public sector excluding social security. This surplus must be compared to the current debt level and current debt service to be financed in the future¹¹.

Using the data described above, we also compute the newborns' generational accounts. We obtain an average discounted lifetime net transfer ($n_{t,t}^a$) of BEF 1.873 million for newborns (see Table 1 below)¹². However, this net transfer is 30% higher in Wallonia (BEF 2.444 million), 23% percent higher in Brussels (BEF 2.316 million) and 53% lower in Flanders (BEF 0.861 million).

Table 1. Key parameters (in millions of BEF)

	Initial debt (B_i)	Population (P_i)	Total net tax of current generations ($\sum_{s=0}^{D_i} N_{t,t-s}^i$)	Efficiency weight future generations (W_i)	Generation. accounts of newborns (n_i)
Wallonia	320,953	3,348,206	3,069,085	840,169	-2.444
Flanders	358,669	937,002	14,624,495	1,373,665	-0.861
Brussels	118,948	5,942,003	1,281,728	257,986	-2.316
Fed. gov ^t	9,808,962	-	-	-	-
Belgium	10,607,532 (B_n)	10,227,211 (P_n)	18,975,308	2,471,820	-1.873 (n_a)

However, combining profits on assets and net interest rates, Feldstein (1995) shows that the pretax real return to capital in the nonfinancial corporate sector averaged 9.3% between the sixties and the mid-nineties. Results for various other discount rates and growth rates are shown in the appendix.

¹⁰ See Beine et al. (1998) for detailed results.

¹¹ The figures presented here partly result from optimistic assumptions. Indeed, we consider that the (growth-corrected) primary public consumption per capita will be constant for current generations for the rest of their lifetime while it is commonly accepted that the cost of pensions for civil servants will increase in the next decades, increasing the true debt left to future generations.

¹² This amount is close to the one presented in Dellis and Lueth (1998): using data for 1995, they estimated the average Belgian generational account at ECU 29,500 (about BEF 1.2 million).

4.3. Debt-sharing and budgetary adjustment

Before computing budgetary neutral sharing rules, it is worth noticing that current generations' efforts at reimbursing public debt imply that future generations will be better off than current ones. Indeed, while the total debt of all levels of government amounts to BEF 10,607 bn (see Table 1), the total present value of net taxes of living generations amounts to BEF 18,975 bn, thereby leaving a negative true debt of BEF -8,368 bn to future generations. In other words, the average net burden of future generations ($\tilde{n}^f$) amounts to BEF -4.1 millions, a transfer 2.18 times greater than that for the current newborns¹³.

In a situation where a true debt equal to BEF -3,834 bn ($\sum_i n_{t,t}^i w_t^i$) would suffice to keep new generations "on track" with generational accounts consistent with tax and benefits legislation applicable to the living, there is no reason a priori to believe that living generations would maintain their efforts of which new generations only would benefit.

Therefore, this is where a political decision would have to be made as to the desirable generational imbalance, π_F or π_P . This would in turn affect the debt-sharing. To illustrate this point, notice that the present values of net taxes of living generations shares of the three regions are 0.16, 0.77 and 0.07, respectively while their shares in the $\sum_i n_{t,t}^i w_t^i$ are instead 0.54, 0.31 and 0.16. It then makes a big difference whether the initial imbalance, or "margin" of BEF 4.534 bn (namely BEF 8.368 bn - BEF 3.834 bn) is shared equiproportionally among the new generations or among the living generations according to the second and first keys, respectively.

4.4. Sharing the public debt

The distributively neutral debt-sharing rules require maintaining the differences in current and future generational accounts while respecting the budgetary constraints. Generational accounts for future generations are, respectively, 30% and 23% higher in Wallonia and Brussels compared to the average, and 53% lower in Flanders, figures which will have to remain the same after the debt-sharing.

Besides, recall that in the case of the AK sharing rule, the initial imbalance or "margin" only benefits future generations ($\pi_P=1$). In the LG sharing rule, the whole initial imbalance would benefit the living generations, leaving the future generations worse-off than in the AK scenario ($\pi_F=1$).

Under the AK sharing rule Flanders would receive a little more than the overall debt - 119.1% exactly - in case of a secession. Assets given to Wallonia and Brussels would amount to 17.7 and 1.4% of the public debt, respectively¹⁴.

¹³ As shown in Docquier and Liégeois (1998), a general equilibrium approach gives less optimistic results.

¹⁴ However, it should be stressed that the results for the AK-rule are very sensitive to the assumptions made as to the discount and the growth rates (see the appendix). Since the debt-shares depend on a ratio of generational accounts, when the

Under the LG sharing rule 97.8% of the overall debt should be assigned to Flanders and 2.6% to Brussels (see Table 2 below). Wallonia should receive assets amounting to 0.4% of the national debt.

Table 2 offers a view of various criteria which can be used to share a public debt. Interestingly, the AK and LG rules offer results which are quite different from most other methods.

Table 2 : Regional shares of the debt following various criteria in 1999
(in % of total)

	Wallonia	Brussels	Flanders
AK sharing-rule	-17.7%	-1.4%	119.1%
LG sharing-rule	-0.4%	2.6%	97.8%
Deschamps'rule	6,0%	5,1%	88,9%
Drèze's BDN rule ^a	15.2%	6.8%	78.0%
Gross Regional Product	29.1%	9.2%	61.7%
Per capita debt-sharing	32.7%	9.2%	58.1%
Historical criterium ^b	85.0%	7.0%	8.0%

Notes : ^a Cf. Drèze (1993), pp. 304-306. $T=15$, $\partial=0.60$. The other parameters correspond to the ones used for the Distributive neutrality rules. ^b For 1985 (cf. Van Rompuy, 1988). Actual figures would be even less favourable to Wallonia.

Following the distributive neutrality criterion, we show that in order to maintain unchanged generational accounts for both current and future generations compared to the status quo, Flanders should receive most if not even the total of the Belgian public debt in case of secession. This reveals both the importance of the current transfers between Regions, but also the enormous loss which most other sharing rules would represent for Brussels and Wallonia following a country partitioning. Indeed, accepting other criteria would simply require higher taxes or lower provision of public goods in these Regions than those which would occur within the current insitutional framework.

The political decisions regarding the intergenerational sharing of the initial budgetary imbalance would have heavy consequences as to the sharing of the debt. Leaving the full benefits of current generations'efforts to reduce the public debt and maintain large primary surpluses to future generations (AK sharing rule) would imply that a smaller share of the debt would go to Flanders than what would occur otherwise. On the contrary, leaving the benefits of current generations'efforts to the living generations would generate a higher debt share for Flanders. These results can be explained by the fact that the share of Flanders in the total net tax of current

generational account used in the denominator is close to zero any small change in the parameters leads to tremendous changes in the results. This is precisely the case for the AK-rule in the Belgian context.

generations is much higher than its share in future generations accounts due to a current more favourable economic situation in this region.

5. Conclusions

In the past, the world has witnessed many secession and country-partitionings cases. Some have been peaceful, such as in Czechoslovakia, while others have resulted in wars, such as in Yugoslavia. In the future, other secession cases might arise. Among the possibles candidates to a very extended autonomy or secession are regions such as Québec, Flanders, Pais Basco or Cataluña.

These situations generally lead to enormous political, social and economic disruptions. They also require some rules concerning how to share the national pre-existing debts. Usually, these rules are based on short-run, politically sustainability considerations. In this perspective, one tends to favour debt-sharing criteria that are easy to understand and to implement, such as a per capita sharing or a sharing based on regional gross regional products.

Surprisingly, few positive criteria to share a public debt have been developed up to now. This article provides a set of rules based on equity-efficiency considerations inspired by Drèze's (1993) proposal. The distributive neutrality criterion advocated here is a rule that determines how to share the debt in order to maintain unchanged net lifetime taxes for current and future generations in each region in case of a secession. Any secession would then arise only for efficiency reasons, not for interregional redistribution considerations.

Adopting this rule could therefore limit international instability by reducing financial incentives to secede for richer regions. In particular, in the European Union context where many regions aspire to a greater autonomy within an already unified economic and monetary union, it provides a fair and transparent principle possibly limiting egoistic (intra-)national aspirations.

The criterion which we propose in this paper is theoretically appealing. However, it does have some shortfalls. First, the determination of age-specific and regional data requires a number of assumptions. Even with reliable statistical data, this might prove a difficulty in implementing the rule in actual cases. Second, the sharing rule strongly depends on regional convergence (or divergence) forecasts not dealt with in this paper. Third, the distributive neutrality used here only focuses on public transfers and not on primary income. Therefore, in terms of fiscal pressure, our criteria are neutral if and only if taxes and transfers evolve with primary incomes in the three regions. As for any debt-sharing rule, the need for some kind of mutual insurance mechanism to deal with regional convergence or divergence in primary income and public expenditures and revenues appears. Last, and most importantly, the criterion offers room for political discussions since it requires an ex ante decision as to the intergenerational fiscal imbalances. When some initial budgetary "margin" exists, a political decision is necessary to determine how to share it among generations. This in turn strongly affects the debt shares of the regions.

An application of the rule to Belgium offers striking results. While the historical criterion is likely to lead to a debt share higher than 100% for the poorest region (Wallonia), our distributive neutrality criterion leads to a debt share close to 100% for the richest region (Flanders). It is unlikely that the distributive neutrality rule would be politically acceptable to the Flemish government in case of secession. But any debt-sharing more favourable to Flanders would imply a situation for future generations in Brussels and Wallonia worse than what would actually occur under a status quo situation.

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APPENDIX :

Sensitivity of debt-shares to discount rate and growth assumptions : LG-rule

Discount rate		3,0%	4,0%	5,0%	6,0%
Growth rate					
1,0%	∂^W	-6.9%	-1.9%	0.8%	2.4%
	∂^F	105.7%	99.6%	96.2%	94.2%
	∂^B	1.2%	2.3%	2.9%	3.4%
1,5%	∂^W	-11.4%	-4.1%	-0.4%	1.7%
	∂^F	111.1%	102.2%	97.8%	95.2%
	∂^B	0.4%	1.8%	2.6%	3.2%
2,0%	∂^W	-18.6%	-7.1%	-2.0%	0.7%
	∂^F	119.6%	105.9%	99.7%	96.4%
	∂^B	-0.9%	1.2%	2.3%	2.9%

Sensitivity of debt-shares to discount rate and growth assumptions : AK-rule

Discount rate		3,0%	4,0%	5,0%	6,0%
Growth rate					
1,0%	∂^W	-72.3%	-27.2%	-10.5%	-1.9%
	∂^F	186.1%	130.9%	110.3%	99.6%
	∂^B	-13.8%	-3.7%	0.2%	2.3%
1,5%	∂^W	-144.2%	-43.9%	-17.7%	-5.9%
	∂^F	273.6%	151.3%	119.1%	104.5%
	∂^B	-29.4%	-7.5%	-1.4%	1.4%
2,0%	∂^W	-504.2%	-74.8%	-28.2%	-11.1%
	∂^F	710.0%	189.2%	132.1%	111.0%
	∂^B	-105.8%	-14.3%	-3.9%	0.1%